TB Elimination

Interferon-Gamma Release Assays (IGRAs) – Blood Tests for TB Infection

What are they?

Interferon-Gamma Release Assays (IGRAs) are whole-blood tests that can aid in diagnosing *Mycobacterium tuberculosis* infection. They do not help differentiate latent tuberculosis infection (LT BI) from tuberculosis disease. Two IGRAs that have been approved by the U.S. Food and Drug Administration (FDA) are commercially available in the U.S. They are:

- QuantiFERON® – TB Gold In-Tube test (QFT–GIT);
- SPOT® *TB* test (T–Spot)

How do they work?

IGRAs measure a person's immune reactivity to *M. tuberculosis*. White blood cells from most persons that have been infected with *M. tuberculosis* will release interferon-gamma (IFN-g) when mixed with antigens (substances that can produce an immune response) derived from *M. tuberculosis*.

To conduct the tests, fresh blood samples are mixed with antigens and controls. The antigens, testing methods, and interpretation criteria for IGRAs differ (see Table 1).

What are the advantages of IGRAs?

- Requires a single patient visit to conduct the test.
- Results can be available within 24 hours.
- Does not boost responses measured by subsequent tests.
- Prior BCG (bacille Calmette-Guérin) vaccination does not cause a false-positive IGRA test result.

What are the disadvantages and limitations of IGRAs?

- Blood samples must be processed within 8-30 hours after collection while white blood cells are still viable.
- Errors in collecting or transporting blood specimens or in running and interpreting the assay can decrease the accuracy of IGRAs.
- Limited data on the use of IGRAs to predict who will progress to TB disease in the future.

Table1: **Differences in Currently Available IGRAs**

	QFT–GIT	T–Spot
Initial Process	Process whole blood within 16 hours	Process peripheral blood mononuclear cells (PBMCs) within 8 hours, or if T-Cell Xtend® is used, within 30 hours.
M. tuberculosis Antigen	Single mixture of synthetic peptides representing ESAT-6, CFP-10 and TB7.7	Separate mixtures of synthetic peptides representing ESAT–6 and CFP-10
Measurement	IFN-g concentration	Number of IFN-g producing cells (spots)
Possible Results	Positive, negative, indeterminate	Positive, negative, indeterminate, borderline

National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention
Division of Tuberculosis Elimination

CS227840_G

Limited data on the use of IGRAs for:

- » Children younger than 5 years of age;
- » Persons recently exposed to *M. tuberculosis*;
- » Immunocompromised persons; and
- » Serial testing.

- Tests may be expensive.

What are the steps in administering an IGRA test?

Confirm arrangements for testing in a qualified laboratory, and arrange for delivery of the blood sample to the laboratory in the time the laboratory specifies to ensure testing of samples with viable blood cells.

- Draw a blood sample from the patient according to the test manufacturer's instructions.
- Schedule a follow-up appointment for the patient to receive test results.
- Based on test results, provide follow-up evaluation and treatment as needed.

How do you interpret IGRA test results?

IGRA interpretations are based on the amount of IFN-g that is released or on the number of cells that release IFN-g. Both the standard qualitative test interpretation (positive, negative, or indeterminate) and the quantitative assay measurements (Nil, TB, and Mitogen concentrations or spot counts) should be reported.

As with the tuberculin skin tests (TSTs), IGRAs should be used as an aid in diagnosing infection with *M. tuberculosis*. A positive test result suggests that *M. tuberculosis* infection is likely; a negative result suggests that infection is unlikely. An indeterminate result indicates an uncertain likelihood of *M. tuberculosis* infection. A borderline test result (T-Spot only) also indicates an uncertain likelihood of *M. tuberculosis* infection.

A diagnosis of LTBI requires that TB disease be excluded by medical evaluation. This should include checking for signs and symptoms suggestive of TB disease, a chest radiograph, and, when indicated, examination of sputum or other clinical samples for the presence of *M. tuberculosis*. Decisions about a diagnosis of *M. tuberculosis* infection should also include epidemiological and historical information.

Recommendations on when to use IGRA tests

- IGRAs can be used in place of (but not in addition to) TST in all situations in which CDC recommends TST as an aid in diagnosing *M. tuberculosis* infection, with preferences and special considerations noted below. This includes contact investigations, testing during pregnancy, and screening of health care workers and others undergoing serial evaluation for *M. tuberculosis* infection. Despite the indication of a preference, use of the alternative test (FDA-approved IGRA or TST) is acceptable medical and public health practice. Caution in interpretation should be used when testing certain populations because of limited data on the use of IGRAs (see Updated Guidelines for Using Interferon Gamma Release Assays to Detect *Mycobacterium tuberculosis* Infection, United States).
- Populations in which IGRAs are preferred for testing:
  - » Persons who have received BCG (either as a vaccine or for cancer therapy); and
  - » Persons from groups that historically have poor rates of return for TST reading.
- TST is preferred over IGRAs for testing children less than 5 years of age.
- As with TST, IGRAs generally should not be used for testing persons who have a low risk of infection and a low risk of disease due to *M. tuberculosis*.
- Each institution and TB control program should evaluate the availability and benefits of IGRAs in prioritizing their use.

- Routine testing with both TST and IGRA is not recommended. However, results from both tests might be useful in the following situations:
  - » When the initial test is **negative** and:
    - – The risk for infection, the risk for progression to disease, and the risk for a poor outcome are high (e.g., HIV infected persons or children under 5 years of age who are exposed to a person with infectious TB).
    - – There is clinical suspicion for TB disease (e.g., signs, symptoms, and/or radiographic evidence suggestive of TB disease) and confirmation of *M. tuberculosis* infection is desired.
    - – Taking a positive result from a second test as evidence of infection increases detection sensitivity.
  - » When the initial test is **positive** and:
    - – Additional evidence of infection is required to encourage acceptance and adherence (e.g., foreign-born healthcare workers who believe their positive TST is due to BCG). A positive IGRA might prompt greater acceptance of treatment for LTBI as compared with a positive TST alone.
    - – The person has a low risk of both infection and progression from infection to TB disease. Requiring a positive result from the second test as evidence of infection increases the likelihood that the test reflects infection. An alternative is to assume, without additional testing, that the initial result is a false positive or that the risk for disease does not warrant additional evaluation or treatment, regardless of test results.
  - » In addition, repeating an IGRA or performing a TST might be useful when the initial IGRA result is indeterminate, borderline, or invalid and a reason for testing persists.

Multiple negative results from any combination of these tests cannot exclude *M. tuberculosis* infection. Steps should be taken to minimize unnecessary and misleading testing of persons at low risk.

Selection of the most suitable test or combination of tests for detection of *M. tuberculosis* infection should be based on the reasons and the context for testing, test availability, and overall cost of testing.

Can IGRAs Be Given To Persons Receiving Vaccinations?

As with TST, live virus vaccines might affect IGRA test results. However, the effect of live virus vaccination on IGRAs has not been studied. Until additional information is available, IGRA testing in the context of live virus vaccine administration should be done as follows:

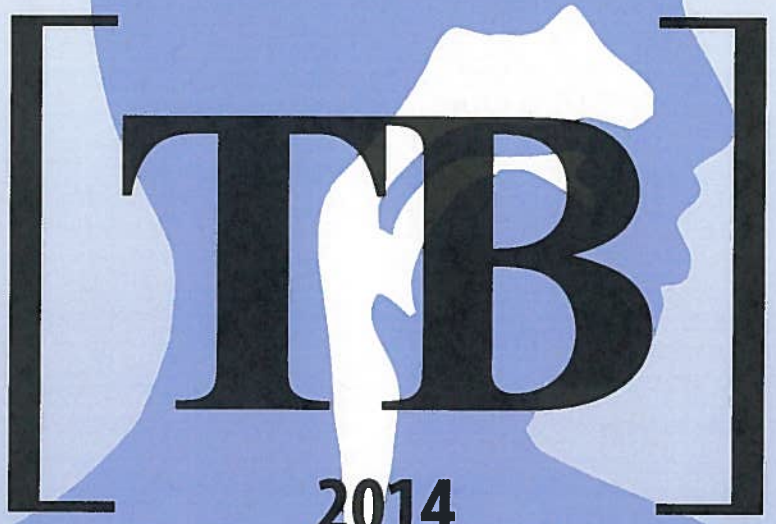
- Either on the same day as vaccination with live-virus vaccine or 4-6 weeks after the administration of the live-virus vaccine
- At least one month after smallpox vaccination

Additional Information

Centers for Disease Control and Prevention. Updated Guidelines for Using Interferon Gamma Release Assays to Detect *Mycobacterium tuberculosis* Infection, United States. (PDF) *MMWR* 2010; 59 (No.RR-5). http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5905a1.htm?s_cid=rr5905a1_e

http://www.cdc.gov/tb

Questions and Answers About Tuberculosis



2014

Centers for Disease Control and Prevention
National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention

Questions and Answers About Tuberculosis

2014

Questions and Answers About Tuberculosis (TB) was written to provide information on the diagnosis and treatment of TB infection and TB disease for persons who do not have a medical background. Key audiences for this booklet are persons with or at risk for TB; persons who provide services for those at high risk for TB such as correctional officers, homeless shelter workers, emergency responders; persons who may have been exposed to someone with TB in a workplace or school setting; and persons who want to learn more about this disease. For additional information on TB, please visit the CDC website: http://www.cdc.gov/tb/

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention

National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention
Division of Tuberculosis Elimination

CONTENTS

For definitions of common terms related to TB, see the glossary at the back of this booklet (page 18).

INTRODUCTION

TESTING & TREATMENT

TB DISEASE

INTRODUCTION

What is TB?

Tuberculosis (TB) is a disease caused by bacteria called *Mycobacterium tuberculosis**. The bacteria usually attack the lungs. But TB bacteria can attack any part of the body such as the kidney, spine, and brain. If not treated properly, TB disease can be fatal. TB disease was once the leading cause of death in the United States.

TB is spread through the air from one person to another. The bacteria are put into the air when a person with TB disease of the lungs or throat coughs, sneezes, speaks, or sings. People nearby may breathe in these bacteria and become infected.

However, not everyone infected with TB bacteria becomes sick. People who are infected, but not sick, have what is called latent TB infection. People who have latent TB infection do not feel sick, do not have any symptoms, and cannot spread TB to others. But some people with latent TB infection go on to get TB disease.

There is good news. People with TB disease can be treated if they seek medical help. Even better, most people with latent TB infection can take medicine so that they will not develop TB disease.

Why is TB still a problem in the United States?

In the early 1900s, TB killed one out of every seven people living in the United States and Europe. Starting in the 1940s, scientists discovered the first of several medicines now used to treat TB. As a result, TB slowly began to decrease in the United States. But in the 1970s and early 1980s, the country let its guard down and TB control efforts were neglected. This led to an increase in the number of TB cases between 1985 and 1992. However, with increased funding and attention to the TB problem, there has been a steady decline in the number of persons with TB since 1993.

TB continues to be a problem. Multidrug-resistant TB (MDR TB) remains a concern, and extensively drug-resistant TB (XDR TB) has become an important issue. While the number of TB cases in the United States has been declining, there remains a higher burden of TB among racial and ethnic minorities. This is due to uneven distribution of TB risk factors that can increase the chance of developing the disease *(see page 8 for list).*

This booklet answers common questions about TB. Please ask your doctor or nurse if you have other questions about latent TB infection or TB disease.

** Words that are underlined can be found in the glossary on page 18.*

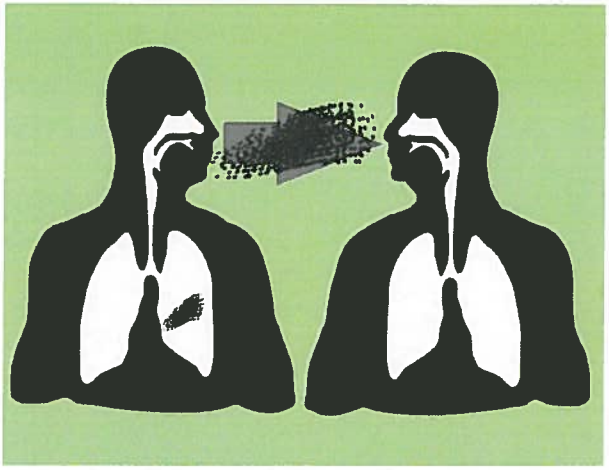
How is TB spread?

TB is spread through the air from one person to another. The bacteria are put into the air when a person with TB disease of the lungs or throat coughs, sneezes, speaks, or sings. People nearby may breathe in these bacteria and become infected.

When a person breathes in TB bacteria, the bacteria can settle in the lungs and begin to grow. From there, they can move through the blood to other parts of the body, such as the kidney, spine, and brain.

TB disease in the lungs or throat can be infectious. This means that the bacteria can be spread to other people. TB in other parts of the body, such as the kidney or spine, is usually not infectious.

People with TB disease are most likely to spread it to people they spend time with every day. This includes family members, friends, and coworkers or schoolmates.



What is latent TB infection?

In most people who breathe in TB bacteria and become infected, the body is able to fight the bacteria to stop them from growing. The bacteria become inactive, but they remain alive in the body and can become active later. This is called latent TB infection. People with latent TB infection:

- Have no symptoms
- Don't feel sick
- Can't spread TB bacteria to others
- Usually have a positive skin test reaction or positive TB blood test *(see pages 6-7)*
- May develop TB disease if they do not receive treatment for latent TB infection *(see page 8)*

Many people who have latent TB infection never develop TB disease. In these people, the TB bacteria remain inactive for a lifetime without causing disease. But in other people, especially people who have weak immune systems, the bacteria become active, multiply, and cause TB disease.

What is TB disease?

If the immune system can't stop TB bacteria from growing, the bacteria begin to multiply in the body and cause TB disease. The bacteria attack the body and destroy tissue. If this occurs in the lungs, the bacteria can actually create a hole in the lung. Some people develop TB disease soon after becoming infected (within weeks) before their immune system can fight the TB bacteria. Other people may get sick years later, when their immune system becomes weak for another reason.

Babies and young children often have weak immune systems. People infected with HIV, the virus that causes AIDS, have very weak immune systems. Other people can have weak immune systems, too, especially people with any of these conditions:

- Substance abuse
- Diabetes mellitus
- Silicosis
- Cancer of the head or neck
- Leukemia or Hodgkin's disease
- Severe kidney disease
- Low body weight
- Certain medical treatments (such as corticosteroid treatment or organ transplants)
- Specialized treatment for rheumatoid arthritis or Crohn's disease

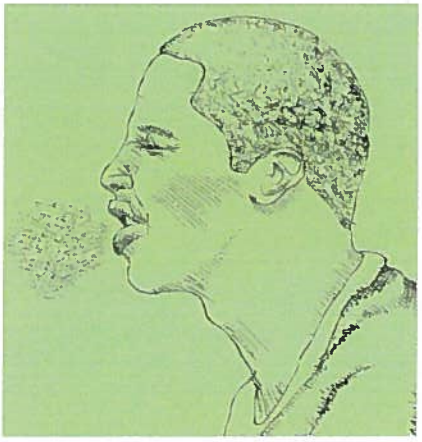
Symptoms of TB disease depend on where in the body the TB bacteria are growing. TB disease in the lungs may cause symptoms such as:

- A bad cough that lasts 3 weeks or longer
- Pain in the chest
- Coughing up blood or sputum (phlegm from deep inside the lungs)

Other symptoms of TB disease are:

- Weakness or fatigue
- Weight loss
- No appetite
- Chills
- Fever
- Sweating at night

For information on how TB disease is treated, see page 12.



The Difference Between Latent TB Infection and TB Disease

A PERSON WITH LATENT TB INFECTION	A PERSON WITH TB DISEASE
• Does not feel sick	• Usually feels sick
• Has no symptoms	• Has symptoms that may include: - A bad cough that lasts 3 weeks or longer - Pain in the chest - Coughing up blood or sputum - Weakness or fatigue - Weight loss - No appetite - Chills - Fever - Sweating at night
• Cannot spread TB bacteria to others	• May spread TB bacteria to others
• Usually has a positive TB skin test or positive TB blood test	• Usually has a positive TB skin test or positive TB blood test
• Has a normal chest x-ray and a negative sputum smear	• May have an abnormal chest x-ray, or positive sputum smear or culture
• Should consider treatment for latent TB infection to prevent TB disease	• Needs treatment for TB disease

TESTING & TREATMENT

Should I get tested for TB?

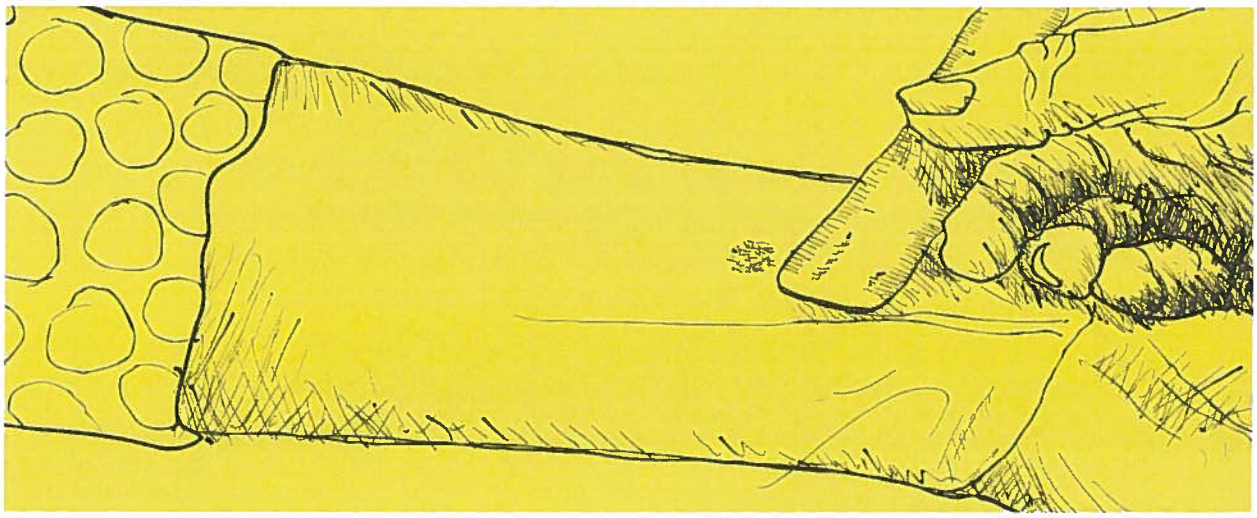
You should get tested for TB if

- You have spent time with a person known or suspected to have TB disease; or
- You have HIV infection or another condition that weakens your immune system and puts you at high risk for TB disease; or
- You have symptoms of TB disease; or
- You are from a country where TB disease is very common (most countries in Latin America and the Caribbean, Africa, Asia, Eastern Europe, and Russia); or
- You live somewhere in the United States where TB disease is more common such as a homeless shelter, migrant farm camp, prison or jail, and some nursing homes; or
- You inject illegal drugs.

What are the tests for TB infection?

The TB skin test

The TB skin test may be used to find out if you are infected with TB bacteria. You can get a skin test at the health department or at your doctor's office. A health care worker will inject a small amount of testing fluid (called tuberculin or PPD) into the skin on the lower part of your arm. After 2 or 3 days, you must return to have your skin test read by the health care worker. You may have swelling where the tuberculin was injected. The health care worker will measure this swelling and tell you if your reaction to the test is positive or negative. A positive reaction usually means that you have been infected by someone with TB disease.



If you have recently been infected with TB bacteria, your TB skin test reaction may not be positive yet. You may need a second skin test 8 to 10 weeks after the last time you spent time with the person with TB disease. This is because it can take several weeks after infection for your immune system to react to the TB skin test. If your reaction to the second test is negative, you probably do not have TB infection.

TB blood tests

TB blood tests use a blood sample to find out if you are infected with TB bacteria. The tests measure the response of TB proteins when they are mixed with a small amount of blood. If your health department does offer the TB blood tests, only one visit is required to draw blood for the test. Examples of these TB blood tests include QuantiFERON®-TB Gold in-Tube test (QFT-GIT) and T-Spot®.*TB* test.

What if I have a positive test for TB infection?

If you have a positive reaction to the TB skin test or TB blood test, your doctor or nurse may do other tests to see if you have TB disease. These tests usually include a chest x-ray. They may also include a test of the sputum you cough up. Because the TB bacteria may be found somewhere other than your lungs, your doctor or nurse may check your urine, take tissue samples, or do other tests. If you have TB disease, you will need to take medicine to treat the disease *(see page 12).*

What if I have been vaccinated with BCG?

BCG is a vaccine for TB. This vaccine is not widely used in the United States, but it is often given to infants and small children in other countries where TB is common. BCG vaccine does not always protect people from getting TB.

If you were vaccinated with BCG, you may have a positive reaction to a TB skin test. This reaction may be due to infection with the TB bacteria. However, in some people, BCG may cause a positive skin test when they are not infected with TB bacteria.

A positive reaction is more likely to mean you have been infected with TB bacteria if:

- You recently spent time with a person who has TB disease; or
- You are from an area of the world where TB disease is very common (such as most countries in Latin America and the Caribbean, Africa, Asia, Eastern Europe, and Russia); or
- You spend time where TB disease is common (homeless shelters, migrant farm camps, drug-treatment centers, health care clinics, jails, prisons).

Unlike the TB skin test, TB blood tests are not affected by prior BCG vaccination. The TB blood tests are less likely to give a false-positive result in people who have received BCG.

If I have latent TB infection, how can I keep from developing TB disease?

Many people who have latent TB infection never develop TB disease. But some people who have latent TB infection are more likely to develop TB disease than others. Those at high risk for TB disease include:

- People with HIV infection
- People who became infected with TB bacteria in the last 2 years
- Babies and young children
- People who inject illegal drugs
- People who are sick with other diseases that weaken the immune system *(see page 3)*
- Elderly people
- People who were not treated correctly for TB in the past

If you have latent TB infection (a positive TB skin test reaction or positive TB blood test) and you are in one of these high-risk groups, you need to take medicine to keep from developing TB disease. This is called treatment for latent TB infection. There are several treatment options.

One treatment option for latent TB infection is isoniazid (INH). Taken for 6 to 9 months, INH kills the TB bacteria that are in the body. If you take your medicine as instructed by your doctor or nurse, it can keep you from developing TB disease. Children, adolescents, and people infected with HIV who have latent TB infection need to take INH for 9 months. The preferred regimen for children 2-11 years old is 9 months of daily INH.

Another effective treatment option for people with latent TB infection is the 12-dose regimen. This regimen of INH and rifapentine (RPT) is taken once a week for 3 months under directly observed therapy (DOT). This means the patient will meet with a health worker at a place they both agree on, and the health worker will observe the patient taking the medicine.

You and your health care provider must decide which treatment option is best for you.

Because there are less bacteria, treatment for latent TB infection is much easier than treatment for TB disease. A person with TB disease has a large amount of TB bacteria in the body. Several drugs are needed to treat TB disease.

Sometimes people are given treatment for latent TB infection even if their TB skin test reaction or TB blood test result is negative. This is often done with infants, children, and people infected with HIV who have recently spent time with someone with TB disease. This is because they are at very high risk of developing TB disease soon after they become infected with TB bacteria.

If you start taking treatment for latent TB infection, you will need to see your doctor or nurse on a regular schedule. It is important that you take all the pills as prescribed. The doctor or nurse will check on how you are doing. Some people have serious side effects from these medicines. If you have any of the following side effects, call your doctor or nurse right away:

- No appetite
- Nausea
- Vomiting
- Yellowish skin or eyes
- Fever for 3 or more days
- Abdominal pain
- Tingling in the fingers and toes
- Pain in lower chest or heartburn
- Feeling itchy
- Skin rash
- Easy bruising
- Bleeding from gums
- Nose bleeding
- Urine becomes dark or brown in color
- Aching joints
- Dizziness

WARNING: Frequent or heavy drinking of alcoholic beverages (wine, beer, and liquor) while taking treatment for latent TB infection can be dangerous. Check with your doctor or nurse for more information.

People who have latent TB infection need to know the symptoms of TB disease *(see page 3)*. If they develop symptoms of TB disease, they should see a doctor right away.

What if I have HIV infection?

Because HIV infection weakens the immune system, people with latent TB infection and HIV infection are at **very high risk** of developing TB disease. All persons with HIV infection should be tested to find out if they have latent TB infection. If they have latent TB infection, they need treatment **as soon as possible** to prevent them from developing TB disease. If they have TB disease, they must take medicine to treat the disease.

NOTE: TB disease can be prevented and treated, even in people with HIV infection.

If I was exposed to someone with TB disease, can I give TB to others?

If you were exposed to someone with TB disease, you may become infected with TB bacteria, but you would not be able to spread the bacteria to others right away. Only persons with TB disease can spread TB to others. Before you would be able to spread TB bacteria to others, you would have to breathe in TB bacteria and become infected. Then the bacteria would have to multiply in your body and cause TB disease. At this point, you could possibly spread TB bacteria to others.

Some people develop TB disease soon (within weeks) after becoming infected, before their immune system can fight the TB bacteria. Other people may get sick years later, when their immune system becomes weak for another reason. Many people with TB infection never develop TB disease.

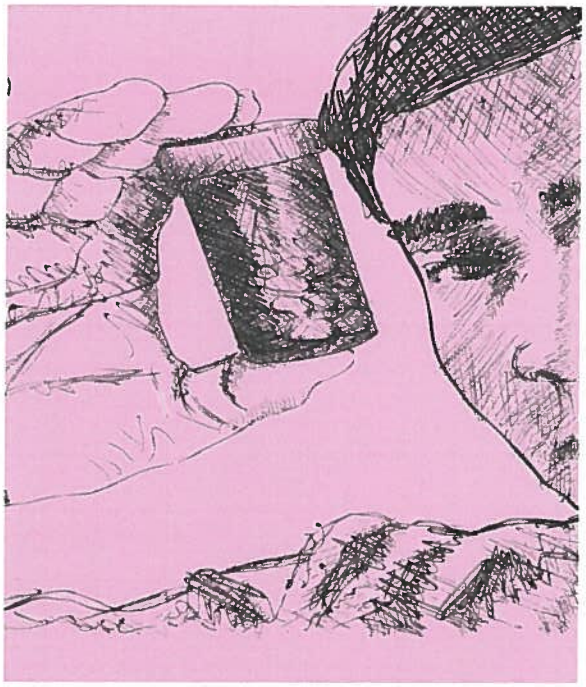
In most people who breathe in TB bacteria and become infected, the body is able to fight the bacteria to stop them from growing. The bacteria become inactive, but they remain alive in the body and can become active later. This is called latent TB infection. People with latent TB infection cannot spread TB bacteria to others. People who have latent TB infection can be treated to prevent developing TB disease.

TB DISEASE

How is TB disease treated?

There is good news for people with TB disease! It can almost always be treated and cured with medicine. But the medicine must be taken as directed by your doctor or nurse.

If you have TB disease, you will need to take several different medicines. This is because there are many bacteria to be killed. Taking several medicines will do a better job of killing all of the bacteria and preventing them from becoming resistant to the medicines.



The most common medicines used to treat TB disease are:

- isoniazid (INH)
- rifampin (RIF)
- ethambutol (EMB)
- pyrazinamide (PZA)

If you have TB disease of the lungs or throat, you are probably infectious. You need to stay home from work or school so that you don't spread TB bacteria to other people. After taking your medicine for a few weeks, you will feel better and you may no longer be infectious to others. Your doctor or nurse will tell you when you can return to work or school or visit with friends.

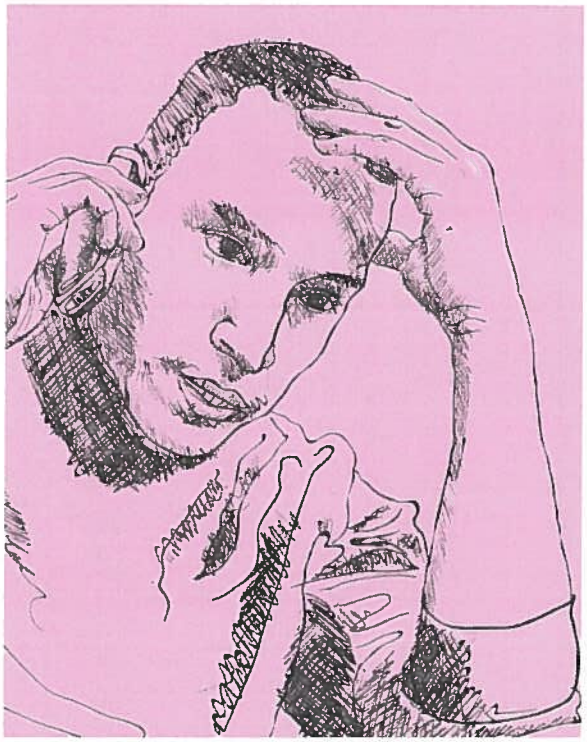
Having TB disease should not stop you from leading a normal life. When you are no longer infectious or feeling sick, you can do the same things you did before you had TB disease. The medicines that you are taking should not affect your strength, sexual function, or ability to work. If you take your medicines as directed by your doctor or nurse, they should kill all the TB bacteria. This will keep you from becoming sick again.

What are the side effects of TB disease medicines?

If you are taking medicines for TB disease, you should take it as directed by your doctor or nurse. The medicines may cause side effects. Some side effects are minor problems. Others are more serious. If you have a serious side effect, **call your doctor or nurse immediately** You may be told to stop taking your medicine or to return to the clinic for tests.

The side effects listed below are **serious**. If you have any of these symptoms, call your doctor or nurse immediately:

- No appetite
- Nausea
- Vomiting
- Yellowish skin or eyes
- Fever for 3 or more days
- Abdominal pain
- Tingling in the fingers or toes
- Pain in the lower chest or heart burn
- Feeling itchy
- Skin rash
- Easy bruising
- Bleeding from gums
- Nose bleeding
- Urine becomes dark or brown in color
- Aching joints
- Dizziness
- Tingling or numbness around the mouth
- Blurred or changed vision
- Ringing in the ears
- Hearing loss



The side effects listed below are **minor** problems. If you have any of these side effects, you can continue taking your medicine.

- Rifampin can turn urine, saliva, or tears orange. The doctor or nurse may advise you not to wear soft contact lenses because they may get stained.
- Rifampin can make you more sensitive to the sun. This means you should use a good sunscreen and cover exposed areas so you don't burn.
- Rifampin makes birth control pills and implants less effective. Women who take rifampin should use another form of birth control.
- If you are taking rifampin as well as methadone (used to treat drug addiction), you may have withdrawal symptoms. Your doctor or nurse may need to adjust your methadone dosage.

Why do I need to take TB medicines regularly?

TB bacteria die very slowly. It takes at least 6 months for the medicines to kill all the TB bacteria. You will probably start feeling well after only a few weeks of treatment. But beware! The TB bacteria are still alive in your body. You must continue to take your medicines until all the TB bacteria are dead, even though you may feel better and have no more symptoms of TB disease.

If you don't continue taking your medicines or you aren't taking all your medicines regularly, this can be very dangerous. The TB bacteria will grow and you will remain sick for a longer time. The bacteria may also become resistant to the medicines you are taking. You may need new, different medicines to kill the TB bacteria if the old medicines no longer work. These new medicines must be taken for a longer time and usually have more serious side effects.

If you become infectious again, you could give TB bacteria to your family, friends, or anyone else who spends time with you. It is **very important** to take your medicines as directed by your doctor or nurse.

What is directly observed therapy (DOT)?

The best way to remember to take your medicines is to get directly observed therapy (DOT). If you get DOT, you will meet with a health care worker every day or several times a week. You will meet at a place you both agree on. This can be the TB clinic, your home or work, or any other convenient location. You will take your medicines at this place while the health care worker watches.

DOT helps in several ways. The health care worker can help you remember to take your medicines and complete your treatment. This means you will get well as soon as possible. With DOT, you may need to take medicines only 2 or 3 times each week instead of every day.

The health care worker will make sure that the medicines are working as they should. This person will also watch for side effects and answer questions you have about TB.

Even if you are not getting DOT, you must be checked at different times to make sure everything is going well. You should see your doctor or nurse regularly while you are taking your medicines. This will continue until you are cured.

How can I remember to take my medicines if I am not on DOT?

The only way to get well is to take your medicines exactly as directed by your doctor or nurse. This may not be easy! You will be taking your medicines for a long time (6 months or longer), so you should get into a routine. Here are some ways to help you remember to take your medicines:

- Take your pills at the same time every day — for example, you can take them before eating breakfast, during a regular coffee break, or after brushing your teeth.
- Ask a family member or a friend to remind you to take your pills.
- Mark off each day on a calendar as you take your medicine.
- Put your pills in a weekly pill dispenser. Keep it by your bed or in your purse or pocket.

NOTE: Remember to keep all medicine out of reach of children.

If you forget to take your pills one day, skip that dose and take the next scheduled dose. Tell your doctor or nurse that you missed a dose. You may also call your doctor or nurse for instructions.

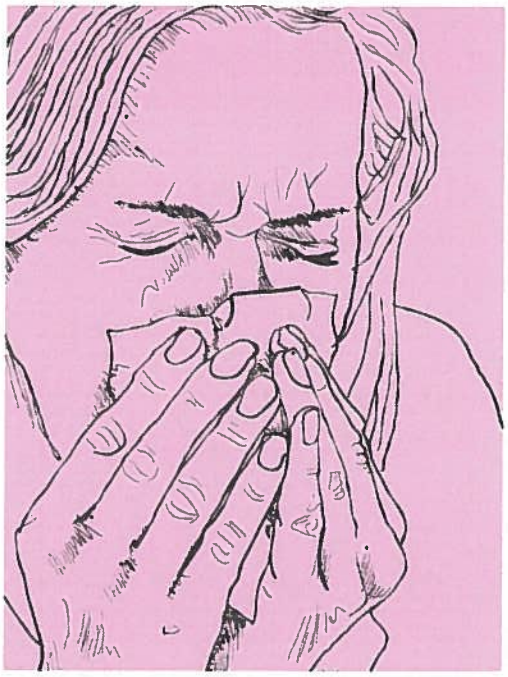
How can I keep from spreading TB?

The most important way to keep from spreading TB is to take all your medicines, exactly as directed by your doctor or nurse. You also need to keep all of your clinic appointments! Your doctor or nurse needs to see how you are doing. You may need another chest x-ray or a test of the phlegm you may cough up. These tests will show whether the medicines are working. They will also show whether you can still give TB bacteria to others. Be sure to tell the doctor about anything you think is wrong.

If you are sick enough with TB disease to go to a hospital, you may be put in a special room. These rooms use air vents that keep TB bacteria from spreading to other rooms. People who work in these special rooms must wear a special face mask to protect themselves from TB bacteria. You must stay in the room so that you will not spread TB bacteria to other people. Ask a nurse for anything you need that is not in your room.

If you are infectious while you are at home, there are things you can do to protect others near you.

- Take your medicines as directed. This is very important!
- Always cover your mouth with a tissue when you cough, sneeze, or laugh. Put the tissue in a closed bag and throw it away.
- Do not go to work or school. Separate yourself from others and avoid close contact with anyone. Sleep in a bedroom away from other family members.
- Air out your room often to the outside of the building (if it is not too cold outside). TB spreads in small closed spaces where air doesn't move. Put a fan in your window to blow out (exhaust) air that may be filled with TB bacteria. If you open other windows in the room, the fan also will pull in fresh air. This will reduce the chances that TB bacteria will stay in the room and infect someone who breathes the air.



Remember, TB is spread through the air. People cannot get infected with TB bacteria through handshakes, sitting on toilet seats, or sharing dishes and utensils with someone who has TB.

After you take the medicines for about 2 or 3 weeks, you may no longer be able to spread TB bacteria to others. If your doctor or nurse agrees, you will be able to go back to your daily routine, including returning to work or school. Remember, you will get well only if you take your medicines exactly as directed by your doctor or nurse.

Think about people who may have spent time with you, such as family members, close friends, and coworkers. The local health department may need to test them for TB infection. TB is especially dangerous for children and people infected with HIV. If infected with TB bacteria, these people need medicine right away to keep from developing TB disease.

What are multidrug-resistant TB (MDR TB) and extensively drug-resistant TB (XDR TB)?

Sometimes the TB bacteria are resistant to the medicines used to treat TB disease. This means that the medicine can no longer kill the bacteria. Multidrug-resistant TB, or MDR TB is caused by bacteria that are resistant to two or more of the most important TB medicines: INH and RIF.

A more serious form of MDR TB is called extensively drug-resistant TB (XDR TB). XDR TB is a rare type of TB that is resistant to nearly all medicines used to treat TB disease.

If you do not take your medicines as directed by your doctor or nurse, the TB bacteria may become resistant to a certain medicine. Also, people who have spent time with someone sick with MDR TB or XDR TB disease can become infected with these multidrug-resistant bacteria.

Drug resistance is more common in people who:

- Have spent time with someone with drug-resistant TB disease;
- Do not take all of their medicines as directed by their doctor or nurse;
- Develop TB disease again, after having taken TB medicines in the past; or
- Come from areas where drug-resistant TB is common.

People with MDR TB or XDR TB disease must be treated with special medicines. These medicines are not as good as the usual medicines for TB, and they may cause more side effects. Also, people with MDR TB and XDR TB disease must see a TB expert who can closely observe their treatment to make sure it is working. Treatment takes much longer than regular TB. And, people with both MDR TB and XDR TB are at greater risk of dying from the disease.

GLOSSARY OF TERMS RELATED TO TB

TB disease – an illness in which TB bacteria are multiplying and attacking a part of the body, usually the lungs. The symptoms of TB disease include weakness, weight loss, fever, no appetite, chills, and sweating at night. Other symptoms of TB disease depend on where in the body the bacteria are growing. If TB disease is in the lungs (pulmonary TB), the symptoms may include a bad cough, pain in the chest, or coughing up blood. A person with TB disease may be infectious and spread TB bacteria to others.

BCG – a vaccine for TB named after the French scientists who developed it, Calmette and Guérin. BCG is rarely used in the United States, but it is often given to infants and small children in other countries where TB is common.

Chest x-ray – a picture of the inside of your chest. A chest x-ray is made by exposing a film to x-rays that pass through the chest. A doctor can look at this film to see whether TB bacteria have damaged the lungs.

Contact – a person who has spent time with a person with infectious TB.

Culture – a test to see whether there are TB bacteria in your phlegm or other body fluids. This test can take 2 to 4 weeks in most laboratories.

Directly observed therapy (DOT) – a way of helping patients take their medicines for TB. If you get DOT, you will meet with a health care worker every day or several times a week. You will meet at a place you both agree on. This can be the TB clinic, your home or work, or any other convenient location. You will take your medicines while the health care worker watches.

Extensively drug-resistant TB (XDR TB) - XDR TB is a rare type of TB disease that is resistant to nearly all medicines used to treat TB.

Extrapulmonary TB – TB disease in any part of the body other than the lungs (for example, the kidney, spine, brain, or lymph nodes).

HIV infection – infection with the human immunodeficiency virus, the virus that causes AIDS (acquired immunodeficiency syndrome). A person with both latent TB infection and HIV infection is at very high risk for developing TB disease.

Isoniazid (INH) – a medicine used to prevent TB disease in people who have latent TB infection. INH is also one of the four medicines often used to treat TB disease.

Latent TB infection – a condition in which TB bacteria are alive, but inactive in the body. People with latent TB infection have no symptoms, don't feel sick, can't spread TB bacteria to others, and usually have a positive TB test. But they may develop TB disease if they do not receive treatment for latent TB infection.

Multidrug-resistant TB (MDR TB) – TB disease caused by bacteria resistant to two or more of the most important medicines: INH and RIF.

Mycobacterium tuberculosis – bacteria that cause latent TB infection and TB disease.

Negative – usually refers to a test result. If you have a negative TB skin test reaction or TB blood test, you probably do not have TB infection.

Positive – usually refers to a test result. If you have a positive TB skin test reaction or TB blood test, you probably have TB infection.

Pulmonary TB – TB disease that occurs in the lungs, usually producing a cough that lasts 3 weeks or longer. Most TB disease is pulmonary.

Resistant bacteria – bacteria that can no longer be killed by a certain medicine.

Rifampin (RIF) – one of the four medicines often used to treat TB disease.

Rifapentine (RPT) – one of two medicines used to treat latent TB infection.

Smear – a test to see whether there are TB bacteria in your phlegm (sputum). To do this test, lab workers smear the sputum on a glass slide, stain the slide with a special dye, and look for any TB bacteria on the slide. This test usually takes 1 day to get the results.

Sputum – phlegm coughed up from deep inside the lungs. Sputum is examined for TB bacteria using a smear; part of the sputum can also be used to do a culture.

TB skin test – a test that is often used to find out if you are infected with TB bacteria. A liquid called tuberculin is injected into the skin on the lower part of your arm. If you have a positive reaction to this test, you probably have TB infection. Other tests will be needed to find out if you have latent TB infection or TB disease.

TB blood test – a test that uses a blood sample to find out if you are infected with TB bacteria. The test measures the response to TB proteins when they are mixed with a small amount of blood. Examples of these TB blood tests include QuantiFERON®-TB Gold In-Tube test (QFT-GIT) and T-Spot®.*TB* test.

Tuberculin or PPD – a liquid that is injected into the skin on the lower part of your arm during a TB skin test. If you have TB infection, you will probably have a positive reaction to the tuberculin.

For more information

or to order educational materials about TB, contact your local Health Department

Or visit:

CDC Division of Tuberculosis Elimination Website
www.cdc.gov/tb

14_249164

TB Control Resources

- Here is the link to the booklet Questions & Answers About TB:

http://www.cdc.gov/tb/publications/faqs/default.htm

- Here is the link to the Interferon-Gamma Release Assays (IGRA's)

http://www.cdc.gov/tb/publications/factsheets/testing/IGRA.htm

- Here is the T-SPOT link http://www.tspot.com/ About the Test, How It differs and Where to Get It